

# THE NORTHERN LIMITS OF THE DISTRIBUTIONS OF HICKORIES IN NEW ENGLAND

WAYNE E. MANNING

Five species of hickories are native to New England, mockernut hickory, *Carya tomentosa* (Poir.) Nutt., bitter-nut hickory, *C. cordiformis* (Wang.) K. Koch, shagbark hickory, *C. ovata* (Mill.) K. Koch, pignut hickory, *C. glabra* (Mill.) Sweet, and sweet pignut or red hickory, *C. ovalis* (Wang.) Sarg. The last species, at one time combined by Little (1953) with *C. glabra*, has recently been designated by him (Little, 1969) as *C. glabra* var. *odorata* (Marsh.) Little.

The exact distribution in New England of these species is still not fully known. Except for some records in southern Quebec, the northern limits in New England represent the northeast limits of the species. The ranges given in various books and on the distribution maps are largely inaccurate and contradictory. This is due partly to lack of collecting, partly to misidentification and partly to guesswork where specimens are unknown. The greatest error is in the distribution of the mockernut. Some of the descriptions of the ranges are much condensed and indefinite, many incorrect; also maps on a smaller scale are usually highly generalized. The best maps in accuracy and detail not only for New England but also Canada and the rest of the United States are those of Little (1965, 1971). The greatest detail in range in New England is given by Blakeslee and Jarvis (1911) and by Seymour (1969, 1970); these are not entirely correct or complete. Seymour gives the distribution by counties and towns and one must know the location of these to fully understand the distribution.

This paper is an attempt to correct as far as possible the ranges of the hickories in New England, and thus show the northeast limits of the species. This will lay a foundation for future workers to make better maps and descriptions of ranges. Also clear are locations where future field

work will be of value. For this study I have checked the identification of the hickories in the major herbaria of northern and central New England: University of Maine (MN, MAINE), U. of New Hampshire (NH, NHA), U. of Vermont (V, VT), U. of Massachusetts (MS, MASS), Dartmouth College (H, HNH), Arnold Arboretum (A, A), Gray Herbarium (G, GH), New England Botanical Club (N, NEBC), Clark University (C, CUW), and Smith College, (S, SCHN). For each herbarium the first symbol is that which I will use in this paper, the second is the official one in *Index Herbariorum* (Lanjouw and Stafleu, 1964). Furthermore, I have recently collected rather extensively in Vermont, western New Hampshire, and northern Massachusetts; the field work has added over 50 towns to the lists of towns given by Seymour (1969). My specimens are deposited in various New England herbaria. The results of my study are given below in the lists of counties and towns under each species and on the maps. In the lists are given the symbols for the names of the herbaria where specimens are located. The symbol "WM" refers to my herbarium at Bucknell University, and "Z" refers to the observation by Dr. Robert Zimmerman, who did not collect specimens. For each species one map gives the detailed presently known distribution indicated for each town in Vermont, New Hampshire, Maine and Massachusetts where a specimen has been collected. A second map shows Little's distribution with my corrections in the New England area; his distribution in eastern New York is included, in order to show where one might look for the species in adjacent areas in New England where no records are now known. With extremely few exceptions I have seen herbarium specimens for each record I have given. The maps and lists of towns are still incomplete as collections are incomplete; there will undoubtedly be additions of towns within the ranges and some extensions of ranges with future collecting. Some of the towns I have given may represent planted trees as it is difficult to be sure of the situation from meager notes on herbarium specimens; even in the

field there are often uncertainties. In Maine, Hyland and Steinmetz (1944) have definitely distinguished native from planted trees, removing pignut and bitternut from the list of native trees of Maine, and indicating in which counties the only native species, *Carya ovata*, is indigenous, and in which it is planted.

It is well known that because of overlapping features and the tremendous variation hickories are very difficult to identify. Thus every species in New England may have hairy leaflets, hairy rachises, 7 leaflets. I have discussed the features used in identification, given suggestions for collecting specimens, and presented a detailed key to species using vegetative as well as reproductive features (Manning, 1950). A less detailed and somewhat modified key to New England species is given below. A full distinction between *C. glabra* and *C. ovalis* is given in the key, despite the fact that the distribution is discussed later under *C. glabra-ovalis* complex.

Under each species are given comments on distribution records. Changes from the maps of Little (1965, 1971) are indicated here as well as on the maps. Also given is a suggested description of the range in New England.

#### Key to New England species of *Carya*

1. Buds completely yellow, scurfy, flattened; leaflets 7-9 (-11), usually narrow; husk very thin, splitting slightly more than half-way; meat very bitter; bark tight. . . . . 2. Bitternut hickory, *C. cordiformis*
1. Buds brown or gray, not scurfy, though sometimes with some yellow scales; meats usually sweet. . . . . 2
2. Teeth (many of them) of leaflets with dense sub-terminal tufts of hairs; leaflets 5, rarely 7; overwintering terminal buds rather slender, 13-22 mm. long, the outer dark brown bud-scales persistent; husk of fruit very thick, splitting to base; nuts white, angled, thin-shelled; bark of older trees shaggy. . . . . 3. Shagbark hickory, *C. ovata*

2. Teeth glabrous or ciliate, without special tufts of hairs; nuts thick-shelled. . . . . 3
3. Leaflets 5-9, fascicled-hairy (tomentose) beneath; branchlets stout; twigs and rachises of leaves often fascicled-hairy; overwintering terminal buds 10-15 mm. long, subglobose, the outer dark bud-scales finally deciduous, so buds gray silky-hairy; husk medium thick, splitting to base; nuts brown, angled; bark tight, furrowed. . . . .  
 . . . . . 1. Mockernut hickory, *C. tomentosa*
3. Leaflets 5-7, glabrous or rarely hairy beneath; twigs glabrous; rachises of leaves usually glabrous or occasionally densely puberulent; branchlets slender; overwintering terminal buds 7-12 mm. long; husk thin; nuts whitish or light brown, smooth or slightly angled. . . . . 4
4. Fruit dark brown, shining, smooth; husk finally splitting only to middle or sometimes by one suture to near base; petiole not red; buds not yellow-dotted; lower leaflet surfaces inconspicuously yellow-dotted; terminal bud slender, pointed, the outer dark brown scales persistent or deciduous; bark tight. . . . .  
 . . . . . 4. Pignut hickory, *C. glabra*
4. Fruit light brown, dull, warty; husk finally splitting to base, hence immature fruit 4-ridged to base; petiole often red; overwintering terminal buds subglobose, essentially blunt, the outer dark bud-scales finally deciduous, the bud then gray, silky-hairy; lateral buds and lower leaflet surfaces conspicuously yellow- and brown-dotted; bark of older trees usually shaggy or loosely scaly. . . . . 4. Sweet pignut, Red hickory, *C. ovalis*

1. *Carya tomentosa* (Poir.) Nutt., mockernut hickory

As noted above, this species has had the greatest errors in published descriptions of ranges and especially in the

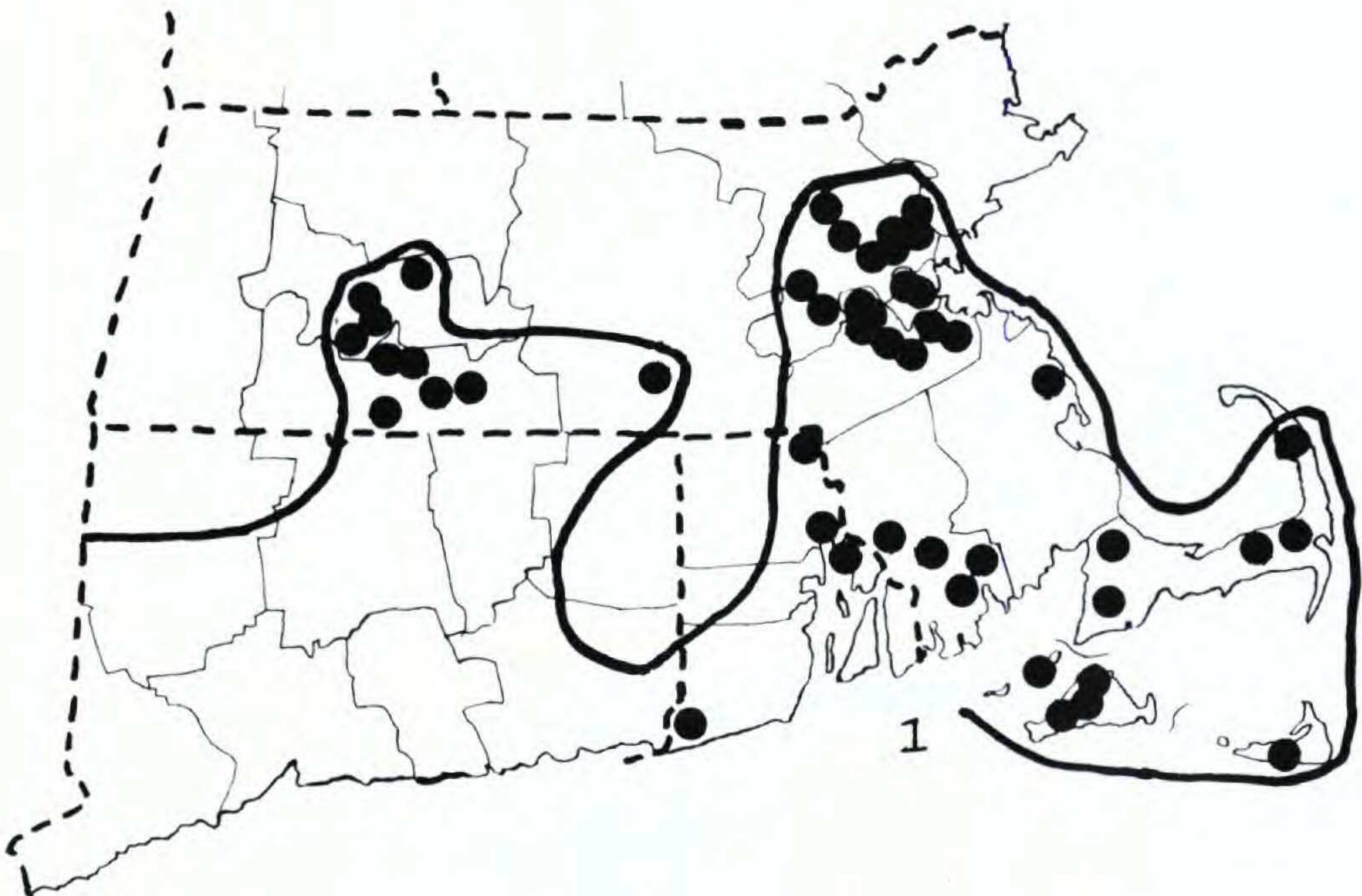
maps. This is due in large part to the fact that the name *Carya alba* has been used by some botanists for mockernut, by others for shagbark. The name is now dropped as a "nomen confusum". Most maps showing clear ranges such as Little (1965), Hough (1907), Jaques (1941), and Harlow (1958) indicate the mockernut as occurring in New Hampshire and Vermont. Most older floras of Vermont (Burns and Otis, 1916, Dole, 1937), report the species in Vermont. However, the northernmost New England known records are in Middlesex and Hampshire (Mt. Warner, North Hadley) Counties, Massachusetts. All records mentioned north of Massachusetts are based on incorrect identification. Strangely enough, the distribution given by Sargent (1933) was essentially correct, and more recent publications have confused the situation. Specimens are here reported from Cape Cod (Barnstable Co., Mass.) but are not shown by Little.

**Massachusetts:** MIDDLESEX CO.: Arlington, N; Belmont, N; Concord, N; Framingham, N; Lincoln, N; Medford, N; Natick, N; Wakefield, N; Waltham, N. SUFFOLK CO.: Boston, N. NORFOLK CO.: Braintree, N; Brookline, N; Canton, N; Dover, N; Milton, N; Needham, N; Norwood, N; Wellesley, N. PLYMOUTH CO.: Marshfield, N. BRISTOL CO.: Dartmouth, N; Fall River, N; New Bedford, N; Swansea, N. BARNSTABLE CO.: Barnstable, WM; Bourne, N; Brewster, N; Dennis, N; Falmouth, N; Sandwich, WM; Wellfleet, N. DUKES CO.: Elizabeth Islands, N; Martha's Vineyard: Chilmark, G, N; Tisbury, N; West Tisbury, G. NANTUCKET CO.: Nantucket Id., G, N. WORCESTER CO.: Oxford, C. HAMPSHIRE CO.: Easthampton, WM; Hadley, G, S, WM; Northampton, WM; Southampton, G, WM.

Maps 1 and 5 show the presently known distribution of the mockernut in New England. This may be stated verbally as: eastern Massachusetts (Middlesex Co. to Cape Cod, Martha's Vineyard, Nantucket) and Connecticut River Valley in Massachusetts (Hampshire and Hampden Co.), Rhode Island and Connecticut. It is absent in Maine, Vermont, New Hampshire, most of central and western Massachusetts.

2. *C. cordiformis* (Wang.) K. Koch, bitternut hickory.

Most maps and descriptions of ranges are essentially



Map 1. Distribution of *Carya tomentosa* in central New England, limits indicated by heavy solid line. A dot designates one or more specimens collected in the town located there.

correct for New England. A few of these report the species in Maine, central New Hampshire and central Vermont. No records are now known of these areas, and probably the maps are merely generalized. My studies show that the bitternut has a somewhat broader distribution in New Hampshire and Vermont than shown by Little. No specimens, however, have been located for the region next to Canada in northwestern Vermont.

**Vermont:** CHITTENDEN CO.: Burlington, v; Charlotte, G, v; Richmond, H, N, v; South Burlington, v. ADDISON CO.: Middlebury, v; Panton, N, v. RUTLAND CO.: Brandon, N, s, v; Castleton, N, v; Ira, N, v; Poultney, H, N, NH, v; Rutland, G, H; Sudbury, N; Wallingford, G; Wells, N, v. BENNINGTON CO.: Arlington, N, v; Dorset, v; Pownal, v; Shaftsbury, N, v. CALEDONIA CO.: Peacham, H. ORANGE CO.: Bradford, H, N, NH, v; Newbury, H, N, NH, v; Thetford, H, N, v. WINDSOR CO.: Hartland, G, H, N, NH, v; Norwich, NH; Springfield, N, v; Weathersfield, N, v., Windsor, WM. WINDHAM CO.: Brattleboro, N, v; Guilford, v, WM; Newfane, N, NH, v; Vernon, N, NH, v.

**New Hampshire:** GRAFTON CO.: Hanover, H, N, v; Haverhill, H, N, NH, v; Lebanon, H, N; Orford, NH. SULLIVAN CO.: Charlestown,

N, V; Claremont, WM; Plainfield, NH. CHESHIRE CO.: Alstead, N, V; Chesterfield, N, V; Hinsdale, H, N, NH, S, V; Keene, N, NH, V; Marlboro, H, N, NH, V; Surry, NH; Swanzey, H, N, NH, V; Walpole, G, H, N, NH, V; Westmoreland, N, NH, V; Winchester, H, N, NH, V. STRAFFORD CO.: Durham, NH; Lee, NH. ROCKINGHAM CO.: Exeter, N; Kensington, NH; Newmarket, NH; South Hampton, NH. HILLSBORO CO.: Hollis, NH.

**Massachusetts:** ESSEX CO.: Andover, G, N; Ipswich, N. MIDDLESEX CO.: Belmont, N; Cambridge, N; Medford, N; Winchester, N. SUFFOLK CO.: Revere, N. NORFOLK CO.: Bellingham, N; Brookline, G, N; Dedham, G, N; Milton, N; Norfolk, N, S; Quincy, N. BRISTOL CO.: Fall River, N; Swansea, N; Westport, N. PLYMOUTH CO.: Hingham, N. WORCESTER CO.: Boylston, MS; Leicester, N; Millbury, C, N; Paxton, C; Princeton, C, N; Spencer, WM; Worcester, C, N. FRANKLIN CO.: Buckland, WM; Montague, N; Sunderland, N, V; Whately, N. HAMPSHIRE CO.: Easthampton, S; Hadley, WM; Hatfield, WM; Huntington, WM; Northampton, WM; Westhampton, WM; Williamsburg, S. HAMPDEN CO.: Chicopee, WM; Holyoke, S; Springfield, WM. BERKSHIRE CO.: Lanesboro, N; Sheffield, G, N; West Stockbridge, N.

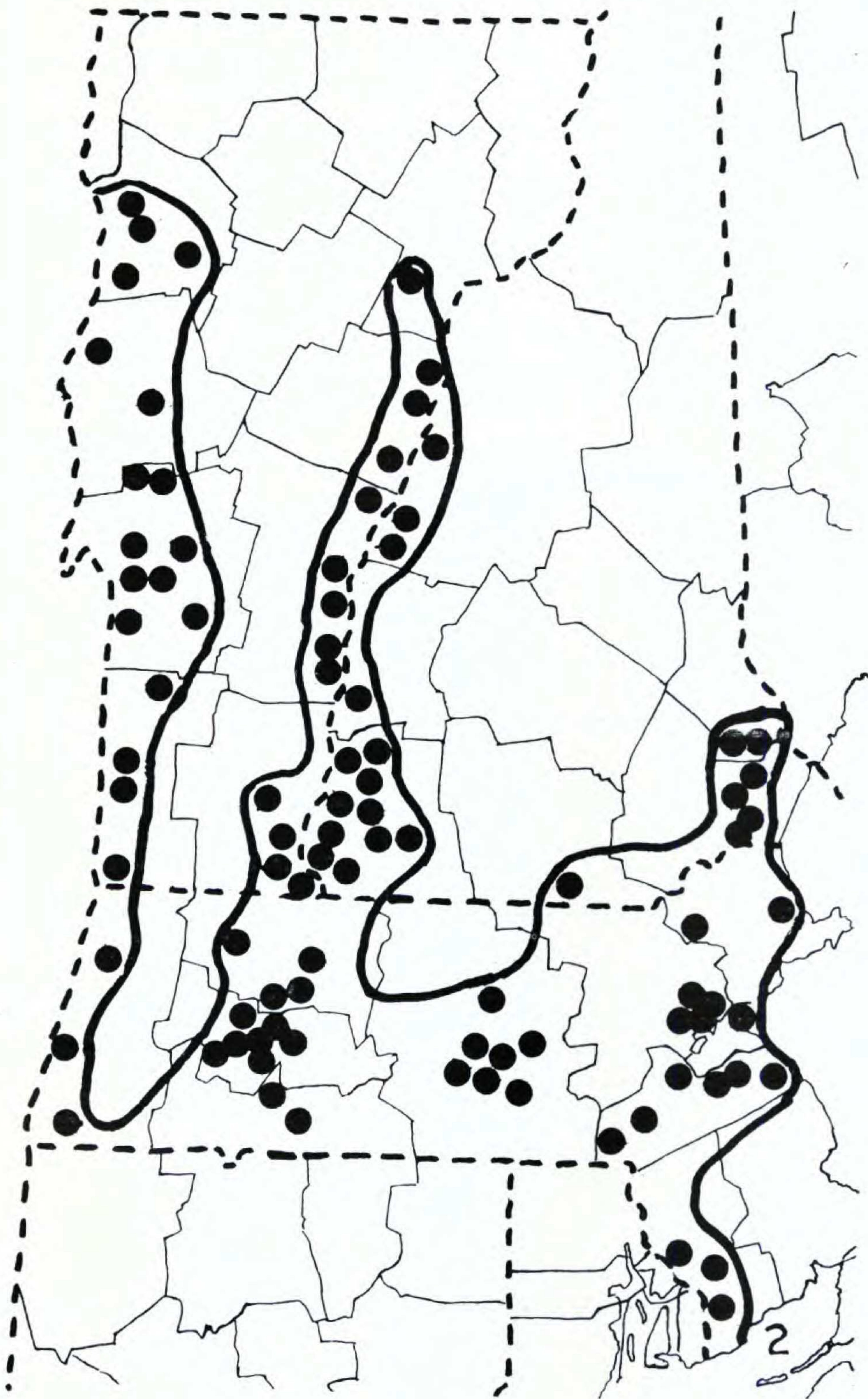
Maps 2 and 6 show the presently known distribution of the bitternut in New England. This may be expressed verbally as: southeastern New Hampshire (to southern Strafford Co.), western New Hampshire and eastern Vermont in the Connecticut River Valley (to Haverhill, N.H. and Peacham, Vt.), western Vermont (north to Burlington), Massachusetts (except for most of Plymouth Co., Cape Cod, Martha's Vineyard, Nantucket, Berkshire Hills), Rhode Island(?) and Connecticut. It is absent in Maine, in central Vermont and central New Hampshire. Seymour (1969) reports the species from the towns of Cumberland and Tiverton in Rhode Island; however, R. L. Hauke, E. A. Palmatier and R. L. Champlin (personal communications) state that the tree does not seem to be native in the state, though it is escaping from cultivation in Kingston.

### 3. *C. ovata* (Mill.) K. Koch, shagbark hickory.

Most maps and descriptions of ranges are essentially correct for this species. Some of these locate the shagbark

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Map 2. Distribution of *Carya cordiformis* in northern and central New England, limits indicated by heavy solid line. A dot designates one or more specimens collected in the town located there.





in northern and central parts of New Hampshire and Vermont or perhaps all of these states, but again these distributions may merely be highly generalized. Seymour (1969) and Little (1965) record the tree on Cape Cod. I have seen the specimen involved and it is *C. ovalis*. Despite the absence of the shagbark on Cape Cod, it occurs on Nantucket Island. There is a possibility that the trees there are planted, but Maria Owen (1888) reported the species as there a long time ago. Mackeever (1968) does not mention the shagbark on the island, though there is a specimen at the N. Y. Botanical Garden. I have seen only one specimen of *C. ovata* in Berkshire Co., but Hoffman (1922) reports the species as, "rich woods, open hillsides, common in the valley". My studies show that the shagbark occurs slightly further north in New Hampshire and Vermont than indicated by Little. The northernmost record for New Hampshire, Groton, in Grafton Co., is based on the observation of Dr. Robert Zimmerman when he was making an intensive study of the northern distribution of the oaks; he did not collect specimens of the hickory.

As I have observed them, the trees are quite rare toward the north in the Connecticut River Valley, often represented by one to few trees in one locality for a whole town; thus it is very easy to miss a record for a town.

**Vermont:** CHITTENDEN CO.: Burlington, N, V; Charlotte, G; Colchester, V; Milton, N; Shelburne, N; South Burlington, V; Williston, H. ADDISON CO.: Cornwall, V; Ferrisburg, G, N; Middlebury, V. RUTLAND CO.: Brandon, H; Castleton, H, N, NH, V; Fair Haven, G; Ira, H, N, NH, V; Poultney, H, N, NH, V; Rutland, H; Sudbury, N; Wells, H, N, NH, V; West Haven, V. BENNINGTON CO.: Arlington, WM; Pownal, N, NH, V; Shaftsbury, WM; Sunderland, WM. WINDSOR CO.: Springfield, WM; Weathersfield, Z; Woodstock, H. WINDHAM CO.: Brattleboro, N; Guilford, WM; Newfane, H, NH, N, V; Townshend, N; Vernon, WM.

**New Hampshire:** GRAFTON CO.: Groton, Z. SULLIVAN CO.: Charlestown, NH, WM. CLAREMONT, WM. CHESHIRE CO.: Chesterfield, WM; Hinsdale, H, N, NH, S, V; Keene, H, N, NH, V; Marlboro, H, N, NH, V; Richmond, N, WM; Swanzey, H, N, NH, S, V; Westmoreland, H, N, NH, V; Winchester, G, N, NH, V. CARROLL CO.: Wolfeboro, NH. BELKNAP CO.: Alton, NH; Gilmanton, NH; Meredith, N; Sanbornton, N. STRAFFORD CO.: Dover, NH; Durham, NH; Farmington, NH; Lee, N;

Middleton, NH; Milton, NH; Rochester, N, NH. MERRIMACK CO.: Warner, N, NH. ROCKINGHAM CO.: Atkinson, N; Derry, N, NH; Fremont, N; Hampton Falls, N; Kensington, N; Nottingham, N; Stratham, N. HILLSBORO CO.: Amherst, N; Hancock, H, N, NH, V; Hillsboro, N; Mason, G, H, N; Merrimack, G, N.

**Maine:** OXFORD CO.: Brownfield, MN; Paris, G, MN; Rumford, MN. CUMBERLAND CO.: Brunswick, MN; Cape Elizabeth, N, NH; Cumberland, G, N, NH, S; North Yarmouth, N, NH; Westbrook, G, NH. YORK CO.: Buxton, N; Eliot, N; Kittery, G, MN, N; Limington, N; North Berwick, G, N; Old Orchard, N; Saco, N; Sanford, MN; South Berwick, MN, N; Wells, N; York, G, MN, N. ANDROSCOGGIN CO.: Livermore Falls, N; Turner, MN, N. SAGadahoc CO.: Arrowsic, MN, NH; Bowdoinham, MN; West Bath, N; Woolwich, MN. SOMERSET CO.: planted?: Solon Village, MN; St. Albans, MN. KENNEBEC CO.: planted?: Augusta-Chelsea town line, MN; Clinton, N; Fayette, NH; Manchester, N; Winthrop, MN.

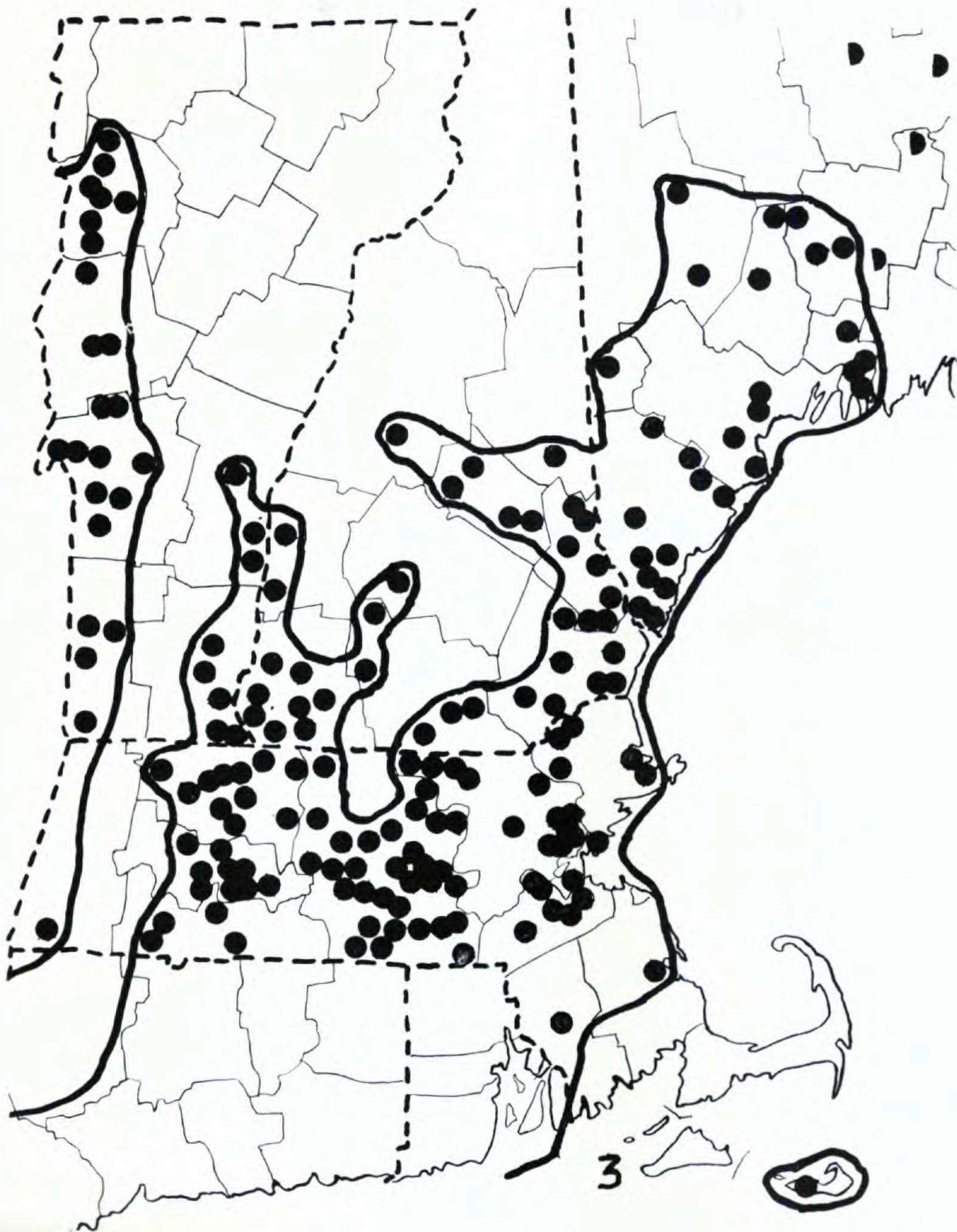
**Massachusetts:** ESSEX CO.: Andover, G, N; Essex, N; Haverhill, N; Ipswich, G, MS; Methuen, N. SUFFOLK CO.: Boston, G, N; Revere, G, N. MIDDLESEX CO.: Ashby, N; Belmont, G; Cambridge, N; Concord, N; Groton, N; Malden, N; Medford, N; Pepperell, N; Tewksbury, N; Townsend, N; Wakefield, N; Woburn, N. NORFOLK CO.: Canton, N; Milton, N; Needham, N; Norfolk, S; Norwood, G; Wellesley, G. BRISTOL CO.: Dighton, N. PLYMOUTH CO.: Kingston, WM, NANTUCKET CO.: Nantucket Id., N. WORCESTER CO.: Auburn, C; Barre, C, MS; Boylston, C; Charlton, C, N; Dudley, C; Hardwick, C, MS; Harvard, C; Holden, C, N; Lancaster, C; Leicester, C; Leominster, N; Lunenburg, N; Millville, C; New Braintree, C; Northboro, C; Northbridge, C; North Brookfield, C; Oakham, C; Oxford, C; Petersham, C; Princeton, C, N; Royalston, N; Rutland, C, N; Shrewsbury, C, N; Southbridge, C; Spencer, C, N; Sutton, C; Upton, C; Westboro, C, N; West Boylston, C; Worcester, C, MS. FRANKLIN CO.: Buckland, WM; Charlton, MS, N; Deerfield, N, V; Gill, WM; Greenfield, WM; Montague, MS, N, V; New Salem, N; Northfield, WM; Orange, MS, WM; Shelburne, N; Sunderland, MS. HAMPSHIRE CO.: Amherst, MS, N; Belchertown, MS; Easthampton, WM; Enfield, MS; Granby, MS; Hadley, WM; Hatfield, MS; Northampton, G, MS, N, S, V; South Hadley, S; Williamsburg, S. HAMPDEN CO.: Granville, G, MS; Holyoke, G, MS; Russell, N; Springfield, N. BERKSHIRE CO.: Sheffield, G, MS.

The records in Kennebec and Somerset counties, Maine are from the University of Maine herbarium, though Hyland and Steinmetz (1944) state that the shagbark is locally planted in the following counties: s. Penobscot, Piscataquis, s. Somerset, c. Oxford, sc. Hancock, ec. Waldo, nw. Knox, e. Kennebec.

Maps 3 and 7 show the presently known distribution of the shagbark in New England. This may be expressed verbally as: southwestern Maine (as far as Sagadahoc and southern Oxford counties) southeastern New Hampshire (as far as southeastern Grafton Co.), along the Connecticut River Valley in southwestern New Hampshire and southeastern Vermont (as far as southern Sullivan Co., N.H. and Windsor Co., Vt.), western Vermont (as far north as Burlington), most of Massachusetts (except Cape Cod, Martha's Vineyard, and Berkshire Hills), Connecticut and Rhode Island. The shagbark is absent in most of central New Hampshire, central Vermont; it is found on Nantucket Island, Mass.

4. *C. glabra-ovalis* complex, pignut hickories [*C. glabra* (Mill.) Sweet, *C. ovalis* (Wang.) Sarg.]

*Carya glabra* and *C. ovalis* have been treated by some authors (Sargent, 1933, Fernald, 1950, Gleason 1952, Seymour, 1969, 1970) as separate species, by others (Robinson and Fernald, 1908, Little, 1953, 1969) as a single species, *C. glabra*. In any case there is tremendous variation in bark, fruit shape, leaves. Thus Sargent, 1933, and especially Steyermark, 1963, not only recognize both species but also a number of varieties and forms under each of the two, based primarily on shape of the fruit; there are also pignuts with hairy leaves. At the present time I am recognizing two species, realizing that there seem to be intergradations (hybridization?) in certain features in some localities. I have not decided which varieties to recognize. The herbarium specimens of New England pignut hickories are extremely unsatisfactory: often only flowering material, or sterile early summer material or poorly collected material without notes on bark. As already stated (Manning, 1950) one needs all possible features for separation of the species, typical leaves (early and late summer condition), true terminal buds in fall condition, mature fruit (preferably after fruit has fallen on the ground), and notes on bark. It is sometimes possible to



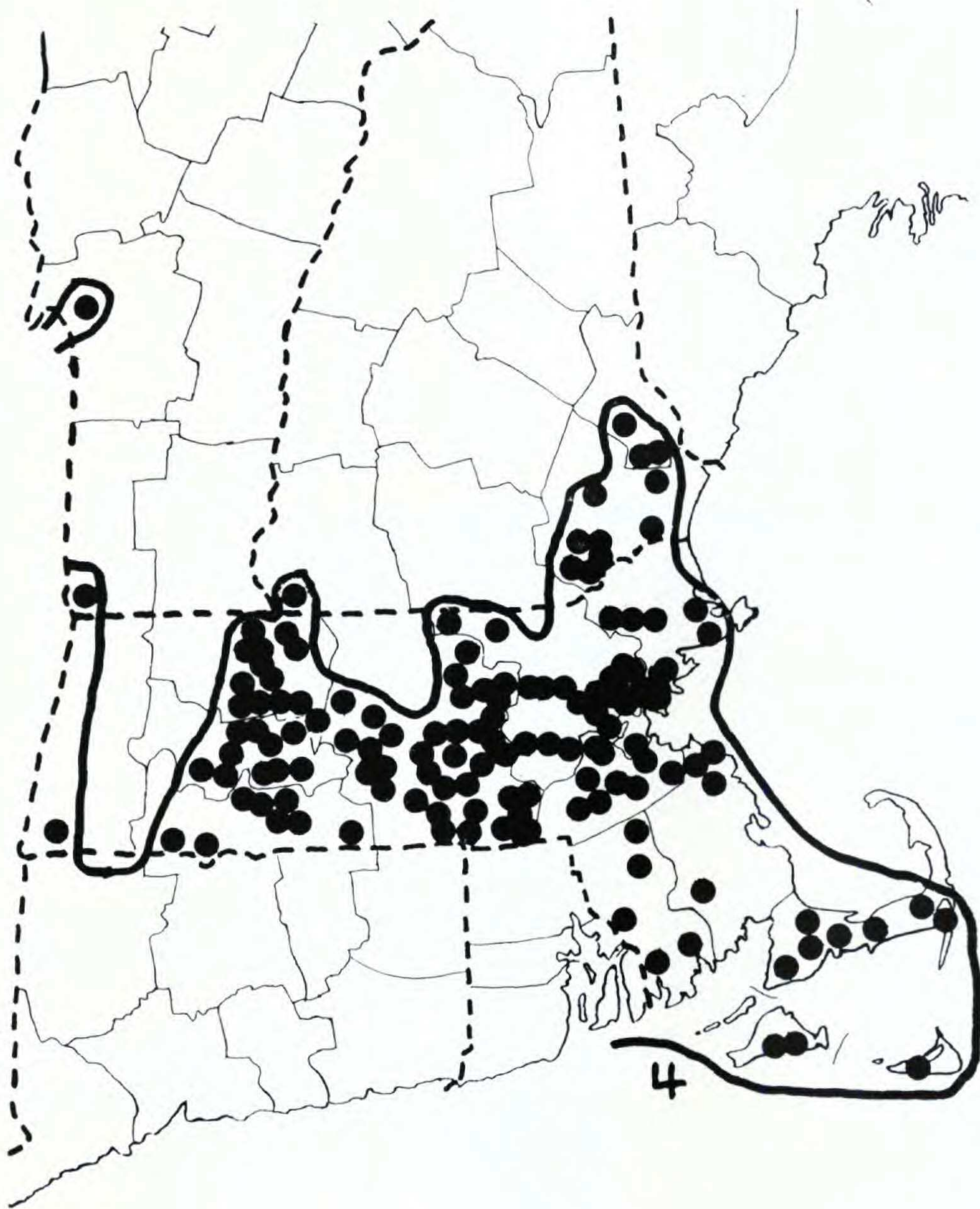
Map. 3. Distribution of *Carya ovata* in northern and central New England, limits indicated by heavy solid line. A dot designates one or more specimens collected in the town located there. The half dots in northern Maine designate towns where specimens have been collected but the trees were probably planted, not native.

name well collected specimens in summer, sterile or fruiting, but in other cases it is nearly impossible.

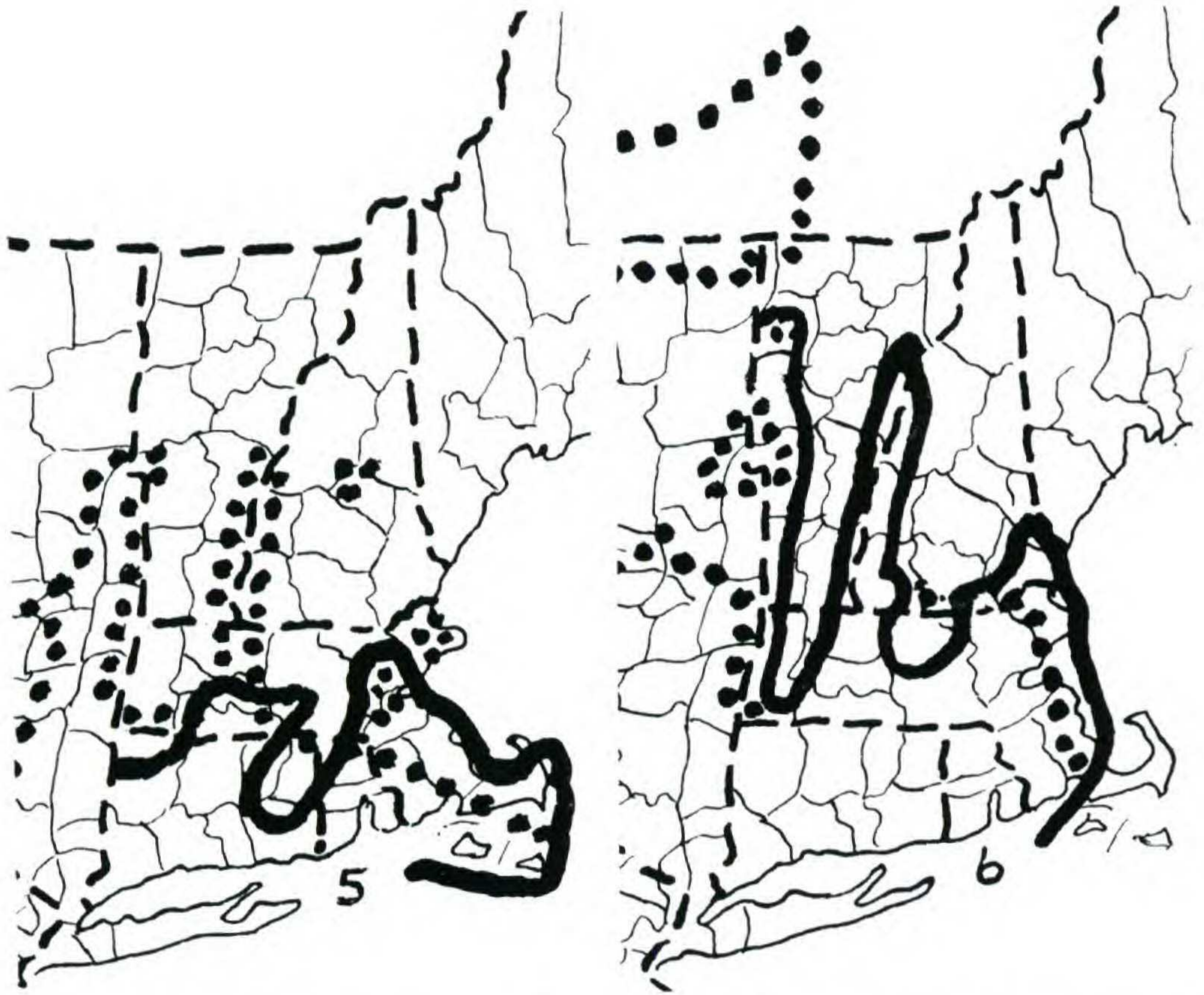
Considering the condition of the specimens available at the present time, for this study I am using the term *Carya glabra-ovalis* complex in order to give a general view of the distribution. Furthermore, in a great many cases the ranges seem to overlap, so this distribution may represent the distribution of each species. In the list of towns I have indicated by "g" and "o" the name given on the herbarium label, but this does not always have significance. I will use the term pignut for both.

There is a wide variation in books with respect to the distribution of the pignuts in New England, whether the treatments represent one or both species. Many of the older books report pignuts as rather common in eastern and western Vermont. Most of these records are based on incorrect identification. Little's (1965, 1971) maps are much more accurate reducing the localities to 2 in western and one in southeastern Vermont. However, I have travelled extensively through southeastern Vermont and have failed to find any pignuts there. I have found pignuts close by on 2 hills in southwestern New Hampshire and on one in northern Massachusetts (north of Bernardston) just 2 miles south of the Vermont border. Little's maps do not show the pignuts found rather recently by Hodgdon in southeastern New Hampshire, nor those which occur on Martha's Vineyard and Nantucket Island.

In western New Hampshire and all of Vermont, pignuts are located on only 4 isolated rather low hills, in general between 600 and 1000 feet elevation. The trees do not seem to occur on longer ridges or at higher elevation or in the valleys. On at least 2 of these hills, Meetinghouse Hill, Winchester, N.H. and Coon Hill near Lake Bomoseen, Rutland Co., Vt., the trees are very numerous near the top. On a third, Television Station Hill, Winchester, N.H., the few large trees near the top seem to be dying out. Very few hills of the numerous hills in the two states have been



Map 4. Distribution of *Carya glabra-ovalis* complex in northern and central New England, limits indicated by heavy solid line. A dot designates one or more specimens collected in the town located there.



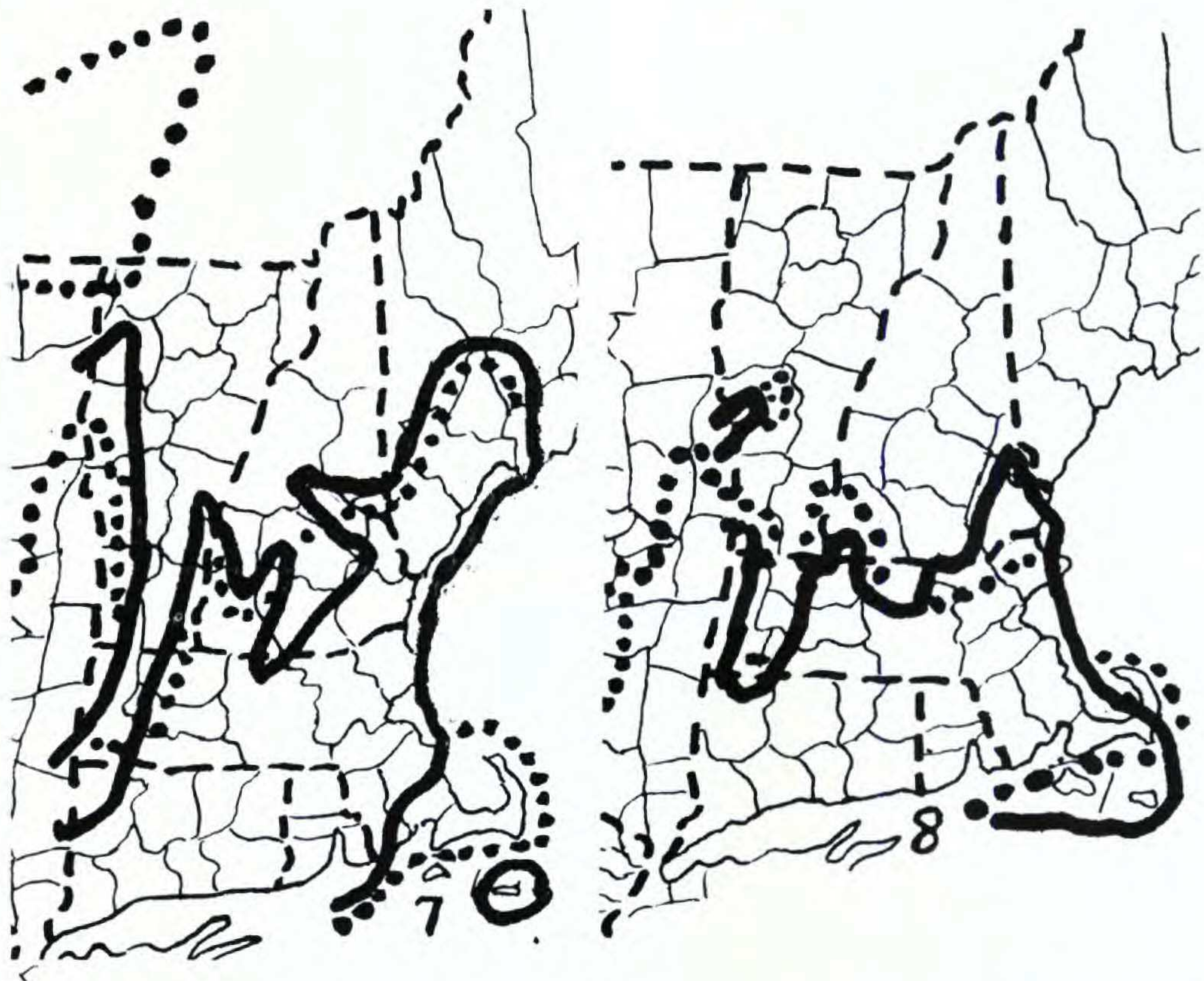
Maps 5, 6. Distribution in New England and adjacent areas of *Carya tomentosa* and *C. cordiformis* respectively according to Little (1965, 1971), his limits indicated by a dotted line where they differ from mine, my corrections indicated by a heavy solid line.

climbed in an attempt to locate hickories, and it is very possible that other hills with pignuts will be found.

**Vermont:** RUTLAND CO.: Castleton, g, o: G, H, MS, N, NH, V, WM. BENNINGTON CO.: Pownal, g: G; o: H, MS, N, NH, V, WM.

**New Hampshire:** CHESHIRE CO.: Winchester, g: N, WM; o: N, V, WM. STRAFFORD CO.: Barrington, o: N, NH; Durham, o: N, NH; Lee, o: N, NH. ROCKINGHAM CO.: Atkinson, o: N, NH; Derry, o: N, NH; Hampstead, g: NH; New Market, g: NH; Raymond, o: N, NH; Salem, g: NH; South Hampton, g: NH; Windham, g: NH. HILLSBORO CO.: Pelham, g, o: N, NH.

**Massachusetts:** ESSEX CO.: Andover, g: N; Boxford, o: N; Ipswich, g: N; Lynn, g: WM; Manchester, g: N; North Andover, o: NH; Saugus, o: N. SUFFOLK CO.: Boston, g, o: G, N; Revere, g: N. MIDDLESEX CO.: Acton, o: WM; Arlington, o: N; Ashby, g:



Maps 7, 8. Distribution in New England and adjacent areas of *Carya ovata* and *C. glabra-ovalis* complex respectively according to Little (1965, 1971), his limits indicated by a dotted line where they differ from mine, my corrections indicated by a heavy solid line.

WM; Belmont, g: N; Boxboro, g: N; Cambridge, g, o: N; Concord, g, o: N; Framingham, o: N; Lexington, g, o: G, N; Lincoln, g, o: N, WM; Medford, g, o: N; Melrose, g: N; Natick, g: N; Newton, o: N; Pepperell, o: NH; Reading, g: N; Stoneham, g: N; Wakefield, g: N; Waltham, o: N; Woburn, g, o: N. PLYMOUTH CO.: Hingham, o: N; Middleboro, g: N; Norwell, g: N. NORFOLK CO.: Canton, g, o: G, N; Cohasset, g, o: G, N; Medfield, o: N; Milton, g, o: G, N, S; Needham, g: N; Norfolk, g, o: N, S; Norwood, g: G; Walpole, g: G; Wellesley, g: G; Weymouth, o: N. BARNSTABLE CO.: Barnstable, g, o: N, WM; Brewster, g, o: G, N; Chatham, o: N; Falmouth, o: N; Mashpee, g: WM; Sandwich, g: WM; Yarmouth, o: N. DUKES CO.: Martha's Vineyard: Edgartown, o: N; West Tisbury, g: G, N. NANTUCKET CO.: Nantucket Id., o: N. BRISTOL CO.: Easton, g, o: G; New Bedford, g: N; Swansea, o: N; Taunton, g: N; Westport, o: N. WORCESTER CO.: *C. glabra*: Bolton, C, N; Charlton, N; Hardwick, C; Lancaster, G; Leominster, C; Lunenburg,



N; Mendon, c; Milford, c; Millbury, c; Sutton, c; Worcester, c, N.  
*C. ovalis*: Auburn, c; Barre, WM; Berlin, c; Blackstone, c; Boylston, c; Brookfield, c; Douglas, c; Holden, c; Harvard, c; Leicester, c; Lunenburg, N; New Braintree, c; Northboro, c; North Brookfield, c; Millville, c; Oakham, s, WM; Oxford, c; Paxton, c; Petersham, c, MS, WM; Shrewsbury, c; Southboro, c, N; Sterling, c, N; Sutton, c; Upton, c; Uxbridge, c; Webster, c; Westboro, c; West Boylston, c; West Brookfield, c; Worcester, G. FRANKLIN CO.: Bernardston, o: MS, N, v; Deerfield, g, o: G, N, v; Erving, g: N; Gill, o: N, v, WM; Greenfield, g, o: MS, N, s, v; Leverett, g: WM; Montague, o: N, v; Northfield, g: N, v; New Salem, o: N; Sunderland, g, o: MS, N, WM; Whately, g: N. HAMPSHIRE CO.: Amherst, o: WM; Belchertown, o: M, WM; Easthampton, o: s, WM; Granby, g: s; Hadley, g, o: s, WM; Hatfield, o: WM; Northampton, g, o: A, G, MS, WM, v; South Hadley, o: WM; Westhampton, g: s, WM. HAMPDEN CO.: Chicopee, g: N; Granville, g: G, MS, N; Holyoke, g, o: s, WM; Ludlow, g: MS; Southwick, g, o: N; Springfield, g, o: MS, N; Wales, o: N; Wilbraham, o: MS. BERKSHIRE CO.: Sheffield, g, o: G, H, N.

Maps 4 and 8 show the presently known distribution of the pignuts in New England. This may be expressed verbally as southeastern New Hampshire, extreme southwestern New Hampshire, west central and extreme southwestern Vermont, most of Massachusetts (except Berkshire Hills), Rhode Island and Connecticut. It is not reported from Maine, eastern Vermont, nor most of New Hampshire and Vermont.

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BOTANICAL LABORATORY

BUCKNELL UNIVERSITY

LEWISBURG, PENNSYLVANIA 17837